70. (Amended) The method of claim 68, wherein the magnetic element is an electromagnet coupled to a current source to induce a magnetic field and wherein adjusting the magnetic element comprises adjusting the current source to increase or decrease the magnetic field.

REMARKS

This is intended as a full and complete response to the Office Action dated March 13, 2003, having a shortened statutory period for response set to expire on June 13, 2003. Claims 1-4, 7-9, and 11-70 are pending after renumbering by the Examiner to remove duplicate numbers and canceling by Applicant of claims 6 and 10. Claims 23, 25, 27-35, 37-44, 50-70 have been amended to correct dependency based on the renumbered claims. Claims 17-25 46-70 have been rewritten to be allowable independent claims or to depend on allowable independent claims by including the limitations of any rejected the base claims and any intervening claims. Applicants believe no new matter has been introduced by the amendments and the new claims presented herein. The amendments have been made in a good faith effort to advance the prosecution on the merits. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-16, 26, 36 and 45 were rejected. Claims 17-25, 27-35, 37-44 and 46-70 are objected to.

Claims 1, 13, and 26 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner asserts the recitation "disposed about the chamber" in claim 1 is indefinite because it is not clear what is being implied by "disposed about the chamber". Claim 1 is amended to clarify that the plasma source is disposed on the chamber. Applicants respectfully request withdrawal of the rejection.

The Examiner asserts the recitation "the top at about a midsection" in claim 13 is indefinite because it is not clear what is being implied "the top at about a midsection". Claim 13 has been amended to clarify that the hollow member (124) linearly traverses

the top or lid (118) of the processing chamber (114) at about the midsection thereof. Applicants respectfully request withdrawal of the rejection.

The Examiner asserts the recitation "disposed about orthogonal" in claim 26 is indefinite because it is not clear what is being implied by "disposed about orthogonal". The first and second hollow members appear perpendicular when viewed from above the chamber, and thus are aligned generally orthogonal although not intersecting. Applicants respectfully request withdrawal of the rejection.

Claim 1 stands rejected under 35 U.S.C. §102(e) as being anticipated by *Hanawa, et al.* (U.S. Patent No. 6,468,388). The Examiner asserts that *Hanawa, et al.* discloses all elements as recited in claim 1.

Hanawa, et al. discloses a reactor chamber (100) comprising, a bottom, a top (110), and a body disposed between the bottom and the top (Fig. 14); a first plasma source or hollow member (150a), defining a first plasma current path; a second plasma source or hollow member (150b), defining a second plasma current path. *Hanawa, et al.* illustrates in one embodiment in Figure 20 the use of focusing magnets to shape the flow of plasma. However, *Hanawa, et al.* does not show a second plasma source disposed on the chamber and overlapping at least a portion of the first plasma source and a second plasma shaping apparatus disposed adjacent the second current path.

Hanawa, et al. does not teach, show or suggest a chamber comprising a bottom, a top, and a body disposed between the bottom and the top; a first plasma source disposed on the chamber and defining a first plasma current path therein; a second plasma source disposed on the chamber and overlapping at least a portion of the first plasma source, wherein the second plasma source defines a second plasma path therein; at least one plasma shaping apparatus disposed adjacent the first plasma current path; and at least one other plasma shaping apparatus disposed adjacent the second plasma current path, as recited in claim 1. Applicants respectfully request withdrawal of the rejection.

Claims 4-5, 7-9, 12-16 stand rejected under 35 U.S.C. §102(e) as being anticipated by *Hanawa, et al.* The Examiner asserts that *Hanawa, et al.* discloses all elements as recited in claims 4-5, 7-9, 12-16. Claims 4-5, 7-9, 12-16 are dependent

upon claim 1 and are therefore patentable because claim 1 is patentable. Applicants respectfully request withdrawal of the rejection.

Claim 26 stands rejected under 35 U.S.C. §102(e) as being anticipated by *Hanawa, et al.* The Examiner asserts that *Hanawa, et al.* discloses all elements as recited in claim 26.

Hanawa, et al. discloses a first hollow member (150a) defining a first plasma current path; a second hollow member (150b) defining a second plasma current path; an RF source (170) disposed under the hollow member to produce a magnetic field within the hollow member. *Hanawa, et al.* illustrates in one embodiment in Figure 20 the use of focusing magnets to shape the flow of plasma; however, the embodiment does not show a second hollow member disposed about orthogonal with respect to the first hollow member and a plasma shaping apparatus disposed adjacent the second current path.

Hanawa, et al. does not teach, show, or suggest a first hollow member defining a first plasma current path; a second hollow member defining a second plasma current path and disposed about orthogonal with respect to the first hollow member; a first RF source disposed along a least a portion of the first hollow member and adapted to produce a first magnetic field within the first hollow member; a second RF source disposed along a least a portion of the second hollow member and adapted to produce a second magnetic field within the second hollow member; a first plasma shaping apparatus disposed at one end of the first hollow member; and a second plasma shaping apparatus disposed at one end of the second hollow member, as recited in claim 26. Applicants respectfully request withdrawal of the rejection.

Claims 27-35 stand objected to as being dependent upon a rejected base claim. Claims 27-25 are dependent upon claim 26 and are therefore patentable because claim 26 is patentable. Applicants respectfully request withdrawal of the rejection.

Claim 36 stands rejected under 35 U.S.C. §102(e) as being anticipated by *Hanawa, et al.* The Examiner asserts that *Hanawa, et al.* discloses all elements as recited in claim 36.

Hanawa, et al. discloses in Figure 20 a body including an inner surface defining an opening to allow plasma therethrough and the use of focusing magnets to shape the flow of plasma.

Hanawa, et al. does not teach, show or suggest a plasma shaping apparatus, comprising a body including an inner surface defining an opening to allow plasma therethrough, wherein the opening has a cross section of varying dimensions to affect plasma current flowing through the opening, as recited in claim 36. Applicants respectfully request withdrawal of the rejection.

Claims 37-44 stand objected to as being dependent upon a rejected base claim. Claims 37-44 are dependent upon claim 36 and are therefore patentable because claim 36 is patentable. Applicants respectfully request withdrawal of the rejection.

Claim 45 stands rejected under 35 U.S.C. §102(e) as being anticipated by *Hanawa, et al.* The Examiner asserts that *Hanawa, et al.* discloses all elements as recited in claim 45.

Hanawa, et al. discloses flowing a first gas into a first plasma current path defined by a first hollow member located external to a processing region; applying power to a first antenna (170) adjacent the first hollow member to inductively couple energy into the first gas to form a first plasma current generating a first plasma from the first gas; flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; and flowing a process gas through a showerhead (210) into the processing region and forming a plasma of the process gas adjacent a substrate using the first plasma of the first gas. *Hanawa, et al.* illustrates in one embodiment in Figure 20 the use of focusing magnets to shape the flow of plasma; however, the embodiment does not show a second current path defined by a second hollow member.

Hanawa, et al. does not teach, show or suggest flowing a first gas into a first plasma current path defined by a first hollow member located external to a processing region; applying power to a first antenna adjacent the first hollow member to inductively couple energy into the first gas to form a first plasma current generating a first plasma

from the first gas; flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; flowing a process gas through a showerhead into the processing region and forming a plasma of the process gas adjacent a substrate using the first plasma of the first gas; shaping the first plasma current with a first and second plasma shaping apparatus located adjacent each end of the first hollow member; and flowing a second gas in a second plasma current path defined by a second hollow member located external to the processing region, as recited in claim 45. Applicants respectfully request withdrawal of the rejection.

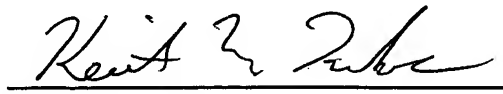
Claims 17-25 and 46-70 stand objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Examiner asserts that these claims would be allowable if rewritten in independent form because the prior art of record fails to appreciate the advantage offered by plasma shape opening registered with an outlet of the first plasma source with the following distinctive features such as set by all of the independent claims. In particular, the art of record fails to teach or fairly suggest constructing plasma shape opening registered with an outlet of the first plasma source, wherein the cross-sectional area of the first portion is different than the cross sectional area of the second portion as possess all of the distinctive features such as defined by independent claims 1 to improve process uniformity. Claims 17-25 and 46-70 have been rewritten in independent form including all of the limitation of the base claim 1 or 45, and any intervening claims.

In conclusion, the references cited by the Examiner, neither alone nor in combination, teach, show, or suggest the method or apparatus of the present invention. Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

The prior art made of record is noted. However, it is believed that the secondary references are no more pertinent to the Applicants' disclosure than the primary references cited in the office action. Therefore, it is believed that a detailed discussion

of the secondary references is not deemed necessary for a full and complete response to this office action. Accordingly, allowance of the claims is respectfully requested.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

1. (Amended) An apparatus for substrate processing, comprising:

a chamber comprising a bottom, a top, and a body disposed between the bottom and the top;

a first plasma source disposed on [about] the chamber and defining a first plasma current path therein; [and]

a second plasma source disposed on the chamber and overlapping at least a portion of the first plasma source, wherein the second plasma source defines a second plasma path therein;

a first [at least one] plasma shaping apparatus disposed adjacent the first plasma current path; and

a second plasma shaping apparatus disposed adjacent the second plasma current path.

2. (Amended) The apparatus of claim 1, wherein the first plasma source comprises a hollow member and [wherein] the [at least one] first plasma shaping apparatus is disposed at one end of the hollow member.

7. (Amended) The apparatus of claim [6] 1, wherein the first and second plasma sources each define an outlet at each of their respective ends and wherein the outlets of the first plasma source are registered with respective openings formed in a first pair of opposing sides of the body and the outlets of the second plasma source are registered with respective openings formed in a second pair of opposing sides of the body.

8. (Amended) The apparatus of claim [6] 1, wherein the first and second plasma sources each comprise:

a hollow member, wherein each hollow member defines at least a portion of the respective first and second plasma paths therein.

11. (Amended) The apparatus of claim [10] 8, wherein each of the plasma shaping apparatuses are disposed at an outlet of the respective hollow member.

13. (Amended) The apparatus of claim 12, wherein the hollow member linearly traverses the top of the chamber at about a midsection thereof.

17. (Amended) [The apparatus of claim 12,] An apparatus for substrate processing, comprising:

a chamber comprising a bottom, a top, and a body disposed between the bottom and the top;

a first plasma source disposed about the chamber and defining a first plasma current path therein, wherein the first plasma source comprises:

a hollow member defining at least a portion of the first plasma current path therein; and

a plenum coupled to each end of the hollow member, wherein each plenum is registered with a respective opening formed in the body; and

at least one plasma shaping apparatus disposed adjacent the first plasma current path, wherein the at least one plasma shaping apparatus is replaceable with one or more plasma shaping apparatus each defining a different geometric plasma shaping opening.

18. (Amended) [The apparatus of claim 1] An apparatus for substrate processing, comprising:

a chamber comprising a bottom, a top, and a body disposed between the bottom and the top;

a first plasma source disposed about the chamber and defining a first plasma current path therein; and

at least one plasma shaping apparatus disposed adjacent the first plasma current path, wherein the at least one plasma shaping apparatus defines a plasma shape opening registered with an outlet of the first plasma source and wherein the plasma shape opening defines at least a first portion and a second portion, wherein the cross-

sectional area of the first portion is different than the cross sectional area of the second portion.

21. (Amended) [The apparatus of claim 1] An apparatus for substrate processing, comprising:

a chamber comprising a bottom, a top, and a body disposed between the bottom and the top;

a first plasma source disposed about the chamber and defining a first plasma current path therein; and

at least one plasma shaping apparatus disposed adjacent the first plasma current path, wherein the at least one plasma shaping apparatus is a magnetic plasma shaping apparatus that provides a magnetic plasma shape opening within the first plasma path.

23. (Amended) The apparatus of claim [20] 22, wherein the at least one magnetic element comprises at least one of magnets, permanent magnets, electromagnets, and combinations thereof.

25. (Amended) The apparatus of claim [21] 22, wherein the position of the magnetic element is adjustable relative the plasma.

27. (Amended) The system of claim [25] 26, wherein the first and second hollow members are made from a material selected from the group consisting of aluminum, anodized aluminum, stainless steel, ceramic, glass, and combinations thereof.

28. (Amended) The system of claim [25] 26, wherein the first and second hollow members each have a gas inlet.

29. (Amended) The system of claim [25] 26, wherein the first pair of plasma shaping apparatus define a first axis and the second pair of plasma shaping apparatus define a second axis substantially orthogonal with respect to the first axis.

30. (Amended) The system of claim [25] 26, wherein each of the first pair of plasma shaping apparatus are in facing relationship and each of the second pair of plasma shaping apparatus are in facing relationship.

31. (Amended) The system of claim [25] 26, wherein the first and second pairs of plasma shaping apparatuses define an opening having a width at least equal to a substrate to be processed within a region between the openings defined by the plasma shaping apparatus.

32. (Amended) The system of claim [25] 26, further comprising:
a substrate support member and a bias RF source coupled to the substrate support member.

33. (Amended) The system of claim [31] 32, further comprising:
a showerhead and a showerhead RF source coupled to the showerhead.

34. (Amended) The system of claim [25] 26, wherein the first and second pair of plasma shaping apparatuses each define a plasma shape opening defining a desired plasma density profile therethrough.

35. (Amended) The system of claim [33] 34, wherein each plasma shape opening defines at least two plasma shaping regions having different geometries from one another.

37. (Amended) The apparatus of claim [35] 36, further comprising an outer vacuum chamber mating surface adapted to mate with a vacuum chamber surface, and a plasma source coupling face adapted to be coupled to a plasma source.

38. (Amended) The apparatus of claim [35] 36, further comprising an inner face adapted to communicate with a processing region of a vacuum chamber defining the vacuum chamber surface.

39. (Amended) The apparatus of claim [35] 36, wherein the body is replaceable with one or more other plasma shaping apparatuses each having an opening with a different cross-sectional geometry.

40. (Amended) The apparatus of claim [35] 36, comprising movable portions which allow the shape of the opening to be changed during a process or between sequential processes to produce a desired plasma distribution in the process region.

41. (Amended) The apparatus of claim [35] 36, comprising at least one magnetic element defining the inner surface to provide at least one magnetic field to form the opening therein.

42. (Amended) The apparatus of claim [40] 41, wherein the at least one magnetic element comprises electromagnets, permanent magnets, and combinations thereof.

43. (Amended) The apparatus of claim [40] 41, wherein the opening is defined by at least one magnetic field wherein the at least one magnetic field is adjusted to define the magnetic opening generally orthogonal to and within the plasma current flow.

44. (Amended) The apparatus of claim [40] 41, wherein the at least one magnetic element is defined by a first magnetic element disposed adjacent to and juxtaposed a second magnetic element, wherein the magnetic fields generated by the first and second magnetic elements define the at least one magnetic opening.

45. (Amended) A method of substrate processing, comprising:

flowing a first gas into a first plasma current path defined by a first hollow member located external to a processing region;

applying power to a first antenna adjacent the first hollow member to inductively couple energy into the first gas to form a first plasma current generating a first plasma from the first gas;

flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; and

flowing a process gas through a showerhead into the processing region and forming a plasma of the process gas adjacent a substrate using the first plasma of the first gas;

shaping the first plasma current with a first and second plasma shaping apparatus located adjacent each end of the first hollow member; and

flowing a second gas in a second plasma current path defined by a second hollow member located external to the processing region.

46. (Amended) [The method of claim 44] A method of substrate processing, comprising:

flowing a first gas into a first plasma current path defined by a first hollow member located external to a processing region, wherein the first gas comprises at least one of nitrogen, hydrogen, oxygen, nitrous oxide, any of the Group VIII noble gases including argon and helium, ammonia, chlorine, boron trichloride, hydrogen chloride, and combinations thereof;

applying power to a first antenna adjacent the first hollow member to inductively couple energy into the first gas to form a first plasma current generating a first plasma from the first gas;

flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; and

flowing a process gas through a showerhead into the processing region and forming a plasma of the process gas adjacent a substrate using the first plasma of the first gas.

47. (Amended) [The method of claim [44] 45] A method of substrate processing, comprising:

flowing a first gas into a first plasma current path defined by a first hollow member located external to a processing region;

applying power to a first antenna adjacent the first hollow member to inductively couple energy into the first gas to form a first plasma current generating a first plasma from the first gas;

flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; and

flowing a process gas through a showerhead into the processing region and forming a plasma of the process gas adjacent a substrate using the first plasma of the first gas, wherein the process gas comprises at least one of a deposition gas, cleaning gas, etch gas, and combinations thereof.

48. (Amended) [The method of claim 44] A method of substrate processing, comprising:

flowing a first gas into a first plasma current path defined by a first hollow member located external to a processing region;

applying power to a first antenna adjacent the first hollow member to inductively couple energy into the first gas to form a first plasma current generating a first plasma from the first gas;

flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; and

flowing a process gas through a showerhead into the processing region and forming a plasma of the process gas adjacent a substrate using the first plasma of the first gas, wherein the process gas comprises [T]trimethylsilane, silane, disilane, chlorinated silanes, TEOS, H_2, NF_3, Ar, He, and combinations thereof.

49. (Amended) [The method of claim 44, further comprising] A method of substrate processing, comprising:

flowing a first gas into a first plasma current path defined by a first hollow member located external to a processing region;

applying power to a first antenna adjacent the first hollow member to inductively couple energy into the first gas to form a first plasma current generating a first plasma from the first gas;

flowing the first plasma generating current across the processing region and through another end of the first hollow member to define a first closed plasma current path; and

flowing a process gas through a showerhead into the processing region and forming a plasma of the process gas adjacent a substrate using the first plasma of the first gas; and

shaping the plasma current with a first and second plasma shaping apparatus located adjacent each end of the first hollow member.

50. (Amended) The method of claim [48] 49, wherein flowing the first gas adjacent each of the respective plasma shaping apparatuses comprises flowing the gases through an opening defined by each of the respective plasma shaping apparatuses, wherein each opening defines geometrically differently shaped regions.

51. (Amended) The method of claim [49] 50, comprising adjusting the geometry of the plasma-shaping apparatuses.

52. (Amended) The method of claim [49] 50, comprising exchanging one or more of the plasma-shaping apparatuses with one or more plasma shaping apparatuses having different geometrically shaped regions.

53. (Amended) The method of claim [49] 50, wherein the opening is registered with an outlet of the external plasma source and wherein the plasma shape opening defines a first portion and a second portion, wherein the second portion is narrower than the first portion.

54. (Amended) The method of claim [48] 49, further comprising flowing a second gas in a second plasma current path defined by a second hollow member located external to the processing region.

55. (Amended) The method of claim [53] 54, further comprising applying RF power to a second antenna in order to inductively couple energy into the second plasma current path and generating a second plasma from the second gas.

56. (Amended) The method of claim [54] 55, wherein the first and second gas comprise at least one of nitrogen, hydrogen, oxygen, nitrous oxide, any of the Group VIII noble gases including argon and helium, ammonia, chlorine, boron trichloride, hydrogen chloride, and combinations thereof.

57. (Amended) The method of claim [54] 55, wherein the first gas and the second gas are the same.

58. (Amended) The method of claim [54] 55, wherein the process gas comprises at least one of a deposition gas, etch gas, cleaning gas, or combinations thereof.

59. (Amended) The method of claim [54] 55, wherein the process gas comprises Trimethylsilane, SiH4, disilane, chlorinated silanes, TEOS, H_2, NF_3, Ar, He, and combinations thereof.

60. (Amended) The method of claim [54] 55, further comprising flowing the second plasma current adjacent a third plasma shaping apparatus adjacent one end of the second hollow member, and flowing a second plasma current across the processing region and adjacent a fourth plasma shaping apparatus located adjacent another end of the second hollow member to define a second closed plasma current path.

61. (Amended) The method of claim [58] 60, wherein flowing the first gas and second gas adjacent each of the respective plasma shaping apparatuses comprises

flowing the gases through an opening defined by each of the respective plasma shaping apparatuses, wherein each opening defines geometrically differently shaped regions.

62. (Amended) The method of claim [59] 61, comprising adjusting the geometry of the plasma-shaping apparatuses.

63. (Amended) The method of claim [59] 61, comprising exchanging one or more of the plasma-shaping apparatuses with one or more plasma shaping apparatuses having different geometrically shaped regions.

64. (Amended) The method of claim [59] 61, wherein the opening is registered with an outlet of the external plasma source and wherein the plasma shape opening defines a first portion and a second portion, wherein the second portion is narrower than the first portion.

65. (Amended) The method of claim [48] 49, wherein the plasma shaping apparatus is a magnetic plasma shaping apparatus.

66. (Amended) The method of claim [63] 65, wherein the plasma-shaping apparatus comprises at least one magnetic field within the opening to shape the plasma within the first plasma current path.

67. (Amended) The method of claim [64] 66, comprising changing the magnetic field during a process or between sequential processes to shape the plasma.

68. (Amended) The method of claim [65] 67, wherein the plasma shaping apparatus includes at least one magnetic element and wherein changing the magnetic field comprises adjusting the at least one magnetic element.

69. (Amended) The method of claim [66] 68, wherein adjusting the magnetic element comprises positioning the magnetic element closer to or further from the plasma.

70. (Amended) The method of claim [66] 68, wherein the magnetic element is an electromagnet coupled to a current source to induce a magnetic field and wherein adjusting the magnetic element comprises adjusting the current source to increase or decrease the magnetic field.